

5.7 Electroplating

In electroplating, a thin layer of one metal is deposited on the surface of another metal. The metal object to be coated is made into the cathode. Nickel, silver, tin, gold and chromium are all used to electroplate metal objects.

There are four stages in the chromium plating of a steel object.

- 1 The steel object, which is made the cathode, is cleaned with sulphuric acid and then washed with de-ionized water.
- 2 The cathode is plated with copper.
- 3 The object is then plated with nickel to prevent corrosion.
- 4 Finally, the object is chromium plated.

Aim

To plate a piece of copper with nickel.

Apparatus and materials

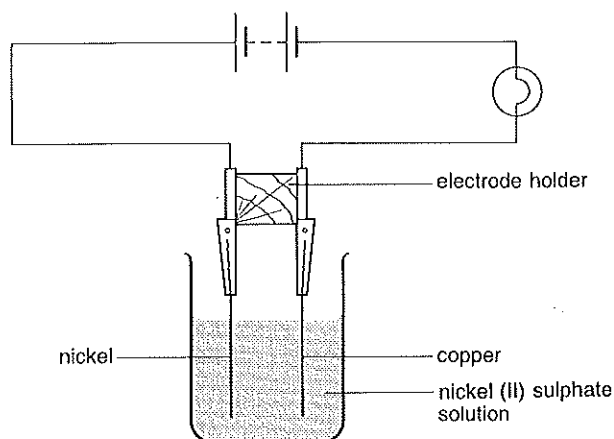
Battery or lab pack to supply 6 V d.c.
6 V bulb and holder
Three lengths of connecting wires
Holder for electrodes
2 beakers, 100 cm³
Steel wool
Paper towels
Nickel sheet, 5 cm × 3 cm
Copper sheet, 5 cm × 3 cm
Nail varnish
Brush
Propanone
Nickel(II) sulphate solution, 30 g dm⁻³, 100 cm³
Sodium hydroxide solution, 1 mol dm⁻³
Distilled water

Precautions

- 1 Sodium hydroxide solution is caustic and damages the skin. If any of the solution gets on your skin wash it off straightaway with a stream of water from the tap.
- 2 Propanone is highly flammable. Keep away from flames.

Procedure

- 1 Clean the copper sheet on both sides by rubbing with steel wool.
- 2 Dip the copper sheet into a beaker containing sodium hydroxide solution. Leave for a few seconds and then wash the sheet with distilled water.



- 3 Write your name on the copper sheet using clear nail varnish. Allow the nail varnish to dry.
- 4 Three-quarters fill the second beaker with nickel(II) sulphate solution.
- 5 Place the nickel sheet (anode) and the copper sheet (cathode) in the electrode holder.
- 6 Lower the electrodes into the nickel(II) sulphate solution and connect the electrodes and light bulb into the circuit. The copper must be connected to the - terminal of the battery and the nickel to the + terminal.
- 7 Allow the current to flow for 10 minutes.
- 8 Remove the copper sheet. Dip a section of a paper towel in propanone and use this to remove the nail varnish.

Results

Sketch and describe the appearance of the copper foil after plating.

Questions

- 1 a) Why is it not necessary to clean the nickel sheet for this experiment?
b) What would happen in this experiment if a very high voltage were used?
c) Why does nickel not form on the nail varnish?
d) Describe the appearance of the solution in the beaker during the electrolysis.
e) Why is it necessary to use sodium hydroxide to clean the copper plate?
- 2 Make a list of common objects and articles that are electroplated. In each case give a reason why you think the objects have been electroplated.